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EP A2 0135299 US 4597627 US 4417736  
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(58) Field of search  
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Selected US specifications from IPC sub-classes  
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(54) High voltage connector

(57) A high voltage electrical connector has a male plug body (10) and a female socket body (10'), wherein the electrical connection between the plug and socket is made between metallic male (48') and female (18a) plug and socket portions which are housed respectively within a portion (38') of the socket body (10') and within a portion (14) of the plug body. Latch (36) is retained by catch (42) when the plug and socket are mated. An insulating ring (28, 28') is carried between a cable (26, 26') and a stud (18, 18') to which the core (22, 22') of the cable is attached. An insert (30, 30') snap fits in the body (10, 10') to retain the cable (26, 26') and ring (28, 28'), and thereby the stud (18, 18').

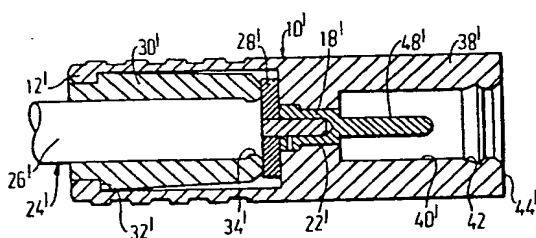


FIG. 1b

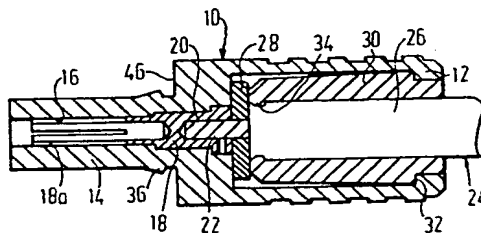


FIG. 1a

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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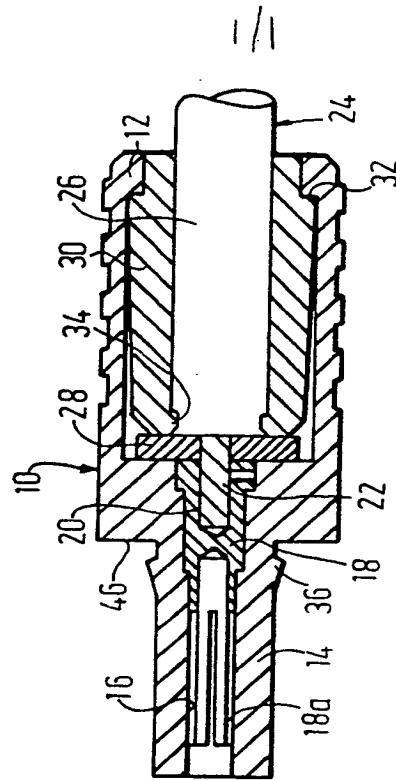


FIG. 1a

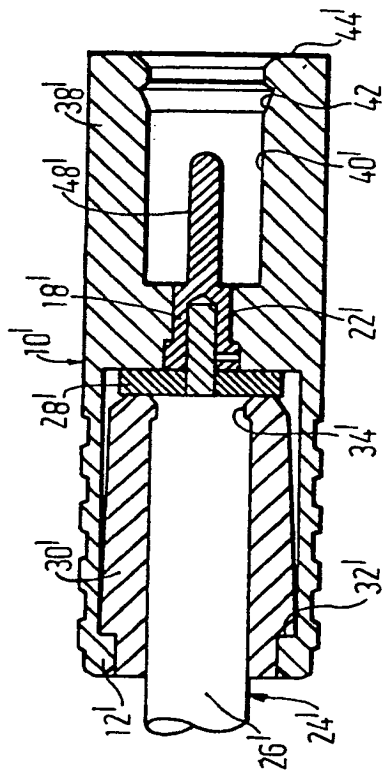


FIG. 1b

- 1 -

High Voltage Connector

The present invention is concerned with plug and socket type connectors for use with relatively high  
5 voltages, in the kilovolt range.

It is a basic requirement of a high voltage connector that it must provide satisfactory electrical isolation of the metallic connecting parts from the external parts of the connector which may have to be  
10 handled when the connector is in operational use. Such devices therefore tend normally to be bulky in order to provide the long electrical breakdown paths necessary to achieve isolation.

A particular problem is involved in the case of  
15 connectors of the type involving male and female plug and socket pairs, where special provision must be made to shield the interengaging male and female portions during actual interconnection of these parts, when they may be in a more exposed condition than when the inter-  
20 engagement between them is complete.

It is an object of the present invention to provide a high voltage connector in which the foregoing problems are mitigated.

In accordance with the present invention, there

is provided a high voltage electrical connector having a male plug component and a female socket component, wherein the electrical connection between the plug and socket components is made between metallic male and female plug and socket portions which are housed respectively within a female socket portion of electrically insulating material on the socket component and within a male plug portion of electrically insulating material on the plug component.

By this construction the components making the electrical connection are fully shielded during insertion of the plug component into the socket component and are isolated by particularly long breakdown paths in the fully connected condition.

Advantageously, the plug portion of electrically insulating material has a tapered projection in its forward end which is adapted to be received with a snap fit connection within a correspondingly shaped recess in the socket portion of electrically insulating material, for holding the plug and socket components together in their coupled condition.

Preferably, the metallic male and female socket portions are formed on the one ends of respective metal studs whose opposite ends contain recesses for receiving the bared ends of respective insulated cables,

the cables being arranged to be held in position by respective tapered sleeves received within internal bores of the plug and socket components with a snap fit connection therebetween.

5           The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:

10           Figures 1a and 1b are longitudinal sections through plug and socket components, respectively, of the embodiment of a connector in accordance with the present invention, two components being shown in their operational condition connected to respective cables.

15           The plug component of the connector shown in Fig. 1a comprises a hollow tubular body 10, preferably made of p.t.f.e., having at its one end a radially inwardly projecting lip 12 and at its other end an axially projecting boss portion 14 containing an axial bore 16 which communicates coaxially with the hollow interior of the main body 10.

20           Disposed within the bore 16 and the hollow interior of the main body 10 is an assembly comprising a metallic stud 18 having formed at its one end a slotted cylindrical socket portion 18a lying within the bore 16 and at its other end a blind bore 20 into which is  
25           soldered, or otherwise attached, the bared end 22 of

of a multi-strand insulated cable 24. Disposed  
between the end of the stud 18 containing the blind  
bore 20 and the end of the cable sheathing 26 is an  
annular disc 28 made of a hard, electrical insulating  
5 material, preferably a hard plastics material.

The above-described assembly is firmly held in  
its illustrated, operational position by means of a  
tapered sleeve 30 which is forced through the hole  
defined by the inner periphery of the lip 12 so that  
10 one end engages against the hard disc 28 and a  
shoulder 32 adjacent its other end engages behind  
the lip 12. An inwardly directed annular projection  
34 at the forward end of the sleeve 30 grips the  
end region of the insulation 26 to add to the stability  
15 of the assembly. Further displacement of the stud 18  
to the left of the position illustrated in Fig 1 is  
prevented by interengagement of annular shoulders on  
the studs with respective shoulders on the internal  
bore of the body 10 and boss portion 14. The inner  
20 end of the boss portion 14 carries an outwardly flared  
projection 36 for engaging a correspondingly shaped  
recess in the socket component as described hereinafter.

The left-hand half of the socket component of the  
connector as viewed in Fig. 1b is of identical  
25 construction to the right-hand half of the plug  
component, as viewed in Fig. 1a. Corresponding

portions are therefore not described in detail again but are marked in Fig. 1b with the same reference numerals as Fig. 1a, but primed.

In contrast to the plug component, the  
5 body 10' of the socket component is formed with a tubular extension 38 defining a cylindrical cavity 40 whose diameter is just greater than the external diameter of the boss portion 14 of the plug component. The outer end of this cylindrical cavity 40 has a  
10 tapered annular groove 42 dimensioned to snugly receive the annular projection 36 on the plug component. The lengths of the boss portion 14 of the plug component and the cylindrical recess of the socket component are chosen such that, when the boss portion is introduced  
15 into the recess 40, the projection snap fits into the recess 42 when the end wall 44 of the socket is engaged by the shoulder 46 on the plug, thereby to hold the plug and socket components together.

The stud member 18' of the socket component is  
20 formed at one end with an axially projecting pin 48 which is adapted to be received within the slotted cylindrical socket portion 18a of the plug component whereby to complete the electrical connection between the cables 24 and 24' when the plug and socket  
25 components are joined together.

It will be appreciated that an unusual feature of this construction is that the electrical connection in the plug component of the connector is actually achieved by means of a socket portion (socket portion 18a of the stud 18) which is itself mounted within a plug portion (boss portion 14) of the plug component. Likewise the electrical connection in the socket component is achieved by means of a plug portion (pin 48) which is itself mounted within a socket portion (tubular portion 38) of the socket component. By this means, it is ensured that the mating electrical portions of the connector are shielded at all times during insertion of the plug component into the socket component and that the completed electrical connection exhibits a particularly long electrical breakdown path in relation to the exterior of the connector. The connector therefore has the advantage that its overall size can be smaller for a given length of breakdown path than has been achieved hitherto in this kind of connector.

The scraping action of the projection 36 on the surface of the internal cavity 40 of the socket component when the components are separated performs self-cleaning of the latter surface 40.

The invention is not restricted to the use of the particular materials mentioned above although the quoted materials are presently preferred.



Advantageously, the interface at 40' in Fig. 1b when the connector is mated should have minimal or zero air gap to prevent possible corona at high voltages. One way in which this can be achieved is for the boss 14 and the bore 40 in which it is received to be tapered, so that on mating there is intimate (air free) contact of the two tapered surfaces.

Also with a view to preventing corona within the connector, the present construction enables the use of grease or high viscosity dielectric oil to fill air gaps in the electrical breakdown paths. For example, if grease is provided at the mating interface 40, it is sealed in by the mated snap-in flange/recess 36, 42 and the interference of parts 18 and 18' in the parts 10 and 10', respectively.

Furthermore, where the cable is connected to both the plug and socket, grease can advantageously be used between the parts 30, 30' and 10 and 10', respectively, such grease being sealed in by the interference of the parts 32 and 32' with parts 30 and 30', respectively.

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CLAIMS

1. A high voltage electrical connector having  
a male plug component and a female socket component,  
wherein the electrical connection between the plug and  
5 socket components is made between metallic male and  
female plug and socket portions which are housed  
respectively within a female socket portion of  
electrically insulating material on the socket  
component and within a male plug portion of electrically  
10 insulating material on the plug component.

2. A high voltage electrical connector as  
claimed in claim 1, wherein the plug portion of  
electrically insulating material carries a tapered  
projection which is adapted to be received with a snap  
15 fit connection within a correspondingly shaped recess  
in the socket portion of electrically insulating  
material, for holding the plug and socket components  
together in their coupled condition.

3. A high voltage connector as claimed in claim  
20 2, wherein said tapered projection is located on the  
rearward end of the plug portion of insulating material  
and said recess is located in the forward end of the  
socket portion.

4. A high voltage electrical connector as claimed  
25 in any of claims 1 to 3, wherein the male and female  
socket portions of electrically insulating material are

both of correspondingly tapered configuration so as to form a close fit one within the other when the latter male portion is introduced into the latter female portion.

5           5. A high voltage connector as claimed in claim 1, 2, 3 or 4, wherein the metallic male and female socket portions are formed on the one ends of respective metal studs whose opposite ends contain recesses for receiving the bared ends of respective  
10 insulated cables, the cables being arranged to be held in position by respective tapered sleeves received within internal bores of the plug and socket components with a snap fit connection therebetween.

          6. A high voltage electrical connector as claimed  
15 in claim 5, wherein there is disposed between each of said metal studs and the respective ends of the associated electrical cables an annular disc made of a hard, electrically insulating material.

          7. A high voltage electrical connector, substantially  
20 as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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